ASHBi SEMINAR

Squeezing the eggs to grow: the mechanobiology of mammalian folliculogenesis and its implications in aging

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Date Monday, 4 August 2025

Time 16:00 – 17:00 [JST]

Venue Conference Room Onsite Only*

B1F, Faculty of Medicine Bldg. B

Register here

Abstract

The maturation of functional eggs in ovarian follicles is a critical process during early mammalian development. However, the underlying mechanisms driving robust follicle growth remain enigmatic. Recent studies showed that follicle growth is sensitive to its mechano-microenvironement, calling for a need to understand mechanical signaling within the follicles. Here, we investigate the mechanical functions of theca cells (TCs) that encapsulate the follicles. Combining bioengineered *ex vivo* assays with biophysical and molecular approaches, we demonstrate that the contractile TCs exert compressive stress to tune intra-follicular pressure, thereby regulating oocyte signaling and follicle growth. We further showed that the TCs are sensitive to the substrate stiffness and curvature, which constitutes a mechano-feedback loop that controls robust follicle growth. Interestingly, spontaneous TC flow between follicles in contact can lead to mechanical instability and differential growth of follicles, largely mediated by oocyte deformation. Finally, I will present label-free, optical elastography studies that reveal three-dimensional spatial elasticity patterns within the ovaries. Collectively, our studies highlight the roles of theca cell mechanics and tissue pressure in regulating follicle development and collective dynamics, misregulation of which can lead to ovarian dysfunctions during aging.

Organizer : Institute for the Advanced Study of Human Biology (WPI-ASHBi), Kyoto University

Host: Dr. Takafumi Ichikawa (Hiiragi Group)

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